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(54)【発明の名称】　金属細線の製造装置

(57)【特許請求の範囲】
【請求項１】　回線が鋭利なエッジをなす銅円盤にその下方から溶融する原料金属を供給して金属細線を形成するための金属細線の製造装置であって、
前記銅円盤の近傍で原料金属が露出するようにその下方から該原料金属をガイドする筒状ガイド部材と、
前記原料金属を前記銅円盤の近傍で溶融させるための加熱手段と、
前記筒状ガイド部材にガイドされた原料金属を前記銅円盤に向けて徐々に、かつ連続的に送り出す手段とを有し、
前記銅円盤と、前記原料金属及びこれを連続的に送り出す手段とが電気的に絶縁されていることを特徴とする金属細線の製造装置。
【請求項２】　前記原料金属が棒状をなし、

前記筒状ガイド部材にガイドされた原料金属を前記銅円盤に向けて徐々に、かつ連続的に送り出す手段が、
前記筒状ガイド部材の直下に設けられた棒状原料金属の補給部と、
前記棒状原料金属を前記補給部に向けて順次補給する補給手段と、
次に前記銅円盤に向けて供給するべく前記補給部に補給される棒状原料金属を介して前記筒状ガイド部材にガイドされた棒状原料金属を押し上げるためのヘッド部と、
前記ヘッド部をその下方から駆動する手段とを有し、
前記銅円盤に向けて供給している棒状原料金属がほとんどまたは全部なくなったら前記ヘッドを下げ、次に前記補給部に補給される棒状原料金属を介して棒状原料金属を前記銅円盤に向けて徐々に押し上げるようにしてなることを特徴とする請求項１に記載の金属細線の製造装

置。

【請求項３】　前記原料金属が長寸の巻取可能な線状をなし、

前記筒状ガイド部材にガイドされた原料金属を前記銅円盤に向けて徐々に、かつ連続的に送り出す手段が、前記筒状ガイド部材の下方にて前記原料金属を直接送り出すローラと、

前記ローラの駆動手段と、

前記線状原料金属が巻回されたリールとを有することを特徴とする請求項２に記載の金属細線の製造装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は金属細線の製造装置に関するものである。

【０００２】

【従来の技術】従来から、金属細線を形成するのに、周縁が鋭いエッジをなす銅円盤を回転させておき、その下方にてサンプルホルダに原料金属を載せ、高周波加熱コイルにより加熱、溶融させ、その後サンプルホルダを上昇させて上記銅円盤に接触させることにより、溶融金属を連続的に線状に固化させる所謂溶湯抽出法がある。

【０００３】

【発明が解決しようとする課題】しかしながら、上記溶湯抽出法の場合、原料金属の量がサンプルホルダの大きさ及び形状により制限され、連続成形が困難であった。また、形成中にサンプルホルダを固定しておくと原料金属が減少することから銅円盤との接触具合が変化し、金属細線の線径などに影響を及ぼし、その品質が低下すると云う問題があった。ここで、例えば原料金属の減少に伴い銅円盤との接触を確保するべくサンプルホルダを上方に移動させると該サンプルホルダと高周波加熱コイルとの位置関係が変化して加熱具合が変化することから溶融金属の温度管理が困難になり、やはり金属細線の品質が低下する。また、連続的に長時間金属細線を形成する場合、原料金属と円盤との間でアーク放電が生じ、加熱装置に過電流が流れて装置の安全回路が働くために加熱できなくなり、金属細線が安定してできなくなると云う問題がある。これは、高周波コイルで加熱すると、試料にうず電流が生じ、これが原料金属と円盤とが瞬間的に離れる際に放電するためと考えられる。本願と同一出願人による特願平７－２１９６６０号明細書には、銅円盤の近傍で露出するように下方から筒状ガイド部材をもって棒状原料金属をガイドし、かつ銅円盤に向けて徐々に、かつ連続的に送り出すようにし、原料金属を銅円盤の近傍で加熱、溶融させて接触させて金属細線を形成する装置及び方法が開示されている。これによれば、或る程度の原料金属を一度に処理でき、銅円盤と原料金属との接触状態を一定な状態に維持できることから高品質の金属細線を連続的に形成することが可能となるが、連続形成するほど上記アーク放電の発生による不具合が問題となる。また、この明細書の装置にあっても、その連続長は棒状原料金属の長さに制限される。

【０００４】本発明は上記したような従来技術の問題点に鑑みなされたものであり、その主な目的は、高品質の金属細線を安定、かつ連続的に形成することが可能な金属細線の製造装置を提供することにある。

【０００５】

【課題を解決するための手段】上述した目的は本発明によれば、周縁が鋭利なエッジをなす銅円盤にその下方から溶融する原料金属を供給して金属細線を形成するための金属細線の製造装置であって、前記銅円盤の近傍で原料金属が露出するようにその下方から該原料金属をガイドする筒状ガイド部材と、前記原料金属を前記銅円盤の近傍で溶融させるための加熱手段と、前記筒状ガイド部材にガイドされた原料金属を前記銅円盤に向けて徐々に、かつ連続的に送り出す手段とを有し、前記銅円盤と、前記原料金属及びこれを連続的に送り出す手段とが電気的に絶縁されていることを特徴とする金属細線の製造装置を提供することにより達成される。特に、前記原料金属が棒状をなし、前記筒状ガイド部材にガイドされた原料金属を前記銅円盤に向けて徐々に、かつ連続的に送り出す手段が、前記筒状ガイド部材の直下に設けられた棒状原料金属の補給部と、前記棒状原料金属を前記補給部に向けて順次補給する補給手段と、次に前記銅円盤に向けて供給するべく前記補給部に補給される棒状原料金属を介して前記筒状ガイド部材にガイドされた棒状原料金属を押し上げるためのヘッド部と、前記ヘッド部をその下方から駆動する手段とを有し、前記銅円盤に向けて供給している棒状原料金属がほとんどまたは全部なくなったら前記ヘッドを下げ、次に前記補給部に補給される棒状原料金属を介して棒状原料金属を前記銅円盤に向けて徐々に押し上げるようになっているか、前記原料金属が長寸の巻取可能な線状をなし、前記筒状ガイド部材にガイドされた原料金属を前記銅円盤に向けて徐々に、かつ連続的に送り出す手段が、前記筒状ガイド部材の下方にて前記原料金属を直接送り出すローラと、前記ローラの駆動手段と、前記線状原料金属が巻回されたリールとを有するようになっていると良い。

【０００６】

【発明の実施の形態】以下、本発明の好適な実施形態を添付の図面について詳しく説明する。

【０００７】図１は、本発明が適用された金属細線の製造装置の構成を示す図である。この装置は、水平に延在する回転軸を中心に回転する銅円盤１と、その下方から径方向に沿って延在し、銅円盤１の周縁近傍で開口する筒状ガイド部材２と、該筒状ガイド部材２の開口近傍でその内部の棒状原料金属Ｍを局部的に加熱するための高周波加熱コイル３と、筒状ガイド部材２内の棒状原料金属Ｍを、後記する次に供給される棒状原料金属Ｍ′を介して徐々に上方に押し上げるためのヘッド部４ａ及び押

し上げロッド４ｂからなる押し上げ部材４と、該押し上げ部材４を駆動するステッピングモータからなるアクチュエータ５とを有している。また、高周波加熱コイル３にはこれを励起する高周波加熱装置７が接続されている。この高周波加熱装置７は、温度調節器８を介して筒状ガイド部材２の開口２ａに於ける溶融した原料金属Ｍの温度を非接触で測定するための放射温度計９に接続されている。尚、放電防止のため、高周波加熱コイル３と筒状ガイド部材２との間及び高周波加熱コイル３と銅円盤１との間には耐熱性絶縁板１０が設けられている。

【０００８】一方、筒状ガイド部材２の下部には棒状原料金属Ｍの補給装置１２が設けられている。この補給装置１２は、筒状ガイド部材２の直下に位置する補給部１３と、棒状原料金属Ｍを縦列に多数受容すると共に補給部１３の側方から順次棒状原料金属Ｍを供給し得るようになっているケース１４と、このケース１４内に受容された棒状原料金属Ｍを押し板１６を介して上記補給部１３に向けて付勢するばね１５とから構成されている。

【０００９】ここで、筒状ガイド部材２及び押し上げ部材４のヘッド部４ａには電気的絶縁材であって、かつ高周波の影響を受けず、原料金属Ｍと反応しない耐熱材料が用いられている。このヘッド部４ａと押し上げロッド４ｂとは、一体であっても別体であっても良い。また、銅円盤１とその回転軸１ａとの間にも電気的絶縁材１ｂが介在している。更に、押し板１６、ケース１４も絶縁材で被覆され、または絶縁材で構成されている。そして、原料金属Ｍ及び銅円盤１は共に接地されていない。従って、両者間にアーク放電が発生する心配がない。

【００１０】尚、高周波加熱コイル３の上端と銅円盤１とは該銅円盤１が高周波の熱の影響を受けないようにするために１０ｍｍ以上離すと良い。また、筒状ガイド部材２の内径は原料金属Ｍの露出する部分の揺れを押さえるべくφ１０ｍｍ以下とし、筒状ガイド部材２の上端と銅円盤１との距離は５ｍｍ以下とすると良い。更に、押し上げロッド４ｂを上下させるアクチュエータ５（ステッピングモータ）の分解能は１／６ｍｍ／ｓ以上が好ましい。尚、少なくとも銅円盤１、筒状ガイド部材２、高周波加熱コイル３及び押し上げ部材４は密閉チャンバ（図示せず）内に受容し、原料金属及び製品としての金属細線の酸化を防止するべく真空（例えば10^{-1}ｔｏｒｒ）にした後に、ガスを導入することにより、無酸素雰囲気下、好ましくは不活性ガス雰囲気下で製造を行うと良い。真空に保持せずに、不活性ガス雰囲気下で製造を行うことにより溶融した原料金属Ｍを細線化する際に効率的に冷却される。

【００１１】以下に、本例の作動要領について説明する。まず、銅円盤１を所定の回転速度（例えば２０００ｒｐｍ）で定速回転させる。そして、銅円盤１に向けて筒状ガイド部材２にガイドされた棒状原料金属を供給するべく、補給部１３に補給される棒状原料金属Ｍを介して徐々に（例えば０．５ｍｍ／ｓｅｃ）棒状原料金属Ｍを押し上げ部材４をもって押し上げつつその先端部を高周波加熱コイル３をもって加熱、溶融させる。次に、溶融した原料金属Ｍの先端部を回転する銅円盤１の鋭利なエッジをなす周縁に接触させて例えば直径２０μｍ～３０μｍ程度の金属細線を形成する。原料金属Ｍの先端部が減るに従い、徐々に押し上げ部材４をもって原料金属Ｍを押し上げて常に銅円盤１の周縁と溶融した原料金属Ｍの先端部との接触状態が一定となるようにアクチュエータ５を制御する。ここで、原料金属Ｍを押し上げる速度が早すぎると、溶融した金属が銅円盤１に接触した際に飛散してしまい、細線化できない。この押し上げる速度は銅円盤１の回転速度との関係で決まり、例えば銅円盤１の回転速度が２０ｍｍ／ｓｅｃ程度の時は、押し上げ速度は１ｍｍ／ｓｅｃ以下が望ましい。

【００１２】また、同時に溶融した原料金属Ｍの先端部の温度を放射温度計９をもって測定し、温度調節器８により高周波加熱装置７、高周波加熱コイル３を介して原料金属Ｍの先端部が常に適正な温度となるようにフィードバック制御する。ここで、上記したように、筒状ガイド部材２の内径をφ１０ｍｍ以下とすることにより、溶融した原料金属Ｍの先端部形状が安定し、温度測定誤差が小さくなり、安定した温度制御が可能となる。

【００１３】そして、銅円盤１に向けて供給している棒状原料金属１がほとんどまたは全部なくなったら高速（例えば１００ｍｍ／ｓｅｃ）で押し上げ部材４を下げる。すると、ばね１５の付勢力によって補給部１３に次の棒状原料金属Ｍが補給される。これをその下部から押し上げ部材４をもって再び徐々に押し上げる。これらは上記したように上方で溶融するため、切れ目がなくなり、１本の長い棒状原料金属を供給しているのと同様になる。このようにして、ケース１４内に棒状原料金属Ｍがなくなるまで連続的に金属細線が形成できる。また、途中でケース１４内に棒状原料金属Ｍを補充可能としておけば、無制限に金属細線を連続形成できることとなる。

【００１３】図２は本発明が適用された別の実施形態に於ける金属細線の製造装置の構成を示す図１と同様な図であり、図１の装置と同様な構造を有する部分には同一の符号を付し、その詳細な説明を省略する。本形態では原料金属Ｍ′が、筒状ガイド部材２に内接する長い線状をなし、その下部はリール２２に巻回されている。また、搬送ローラ２４ａ、２４ｂをもって線状原料金属Ｍ′を直接挟持し、アクチュエータ２５をもって上方に送り出すようにしている。その送り速度は上記実施形態と同様である。また、他の装置構成及び温度制御の方法など製造手順も上記実施形態と同様である。尚、金属細線を上記したように密閉チャンバ内で形成する構成とし、上記リール２２をその外部に配置する場合、線状原料金属Ｍ′の通路にシールを設けると良い。

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【００１４】

【発明の効果】以上の説明により明らかなように、本発明による金属細線の製造装置によれば、銅円盤の近傍で露出するように下方から筒状ガイド部材をもって原料金属をガイドし、かつ銅円盤に向けて徐々に、かつ連続的に送り出すようにし、原料金属を銅円盤の近傍で加熱、溶融させて接触させて金属細線を形成する構成とし、銅円盤と、原料金属及びこれを連続的に送り出す手段とを電気的に絶縁することにより、原料金属と円盤との間のアーク放電を防止できる。これにより、また原料金属を途切れることなく連続的に補充、供給することにより、高品質の金属細線を連続的に形成することが可能となる。

【図面の簡単な説明】

【図１】本発明が適用された金属細線の製造装置の構成を示す図。

【図２】本発明が適用された金属細線の製造装置の構成を示す図１と同様な図。

【符号の説明】

１　銅円盤

１ａ　回転軸

8

＊１ｂ　電気的絶縁材

２　筒状ガイド部材

２ａ　開口

３　高周波加熱コイル

４　押し上げ部材

４ａ　ヘッド部

４ｂ　押し上げロッド

５　アクチュエータ

７　高周波加熱装置

８　温度調節器

９　放射温度計

１０　耐熱性絶縁板

１２　補給装置

１３　補給部

１４　ケース

１５　ばね

１６　押し板

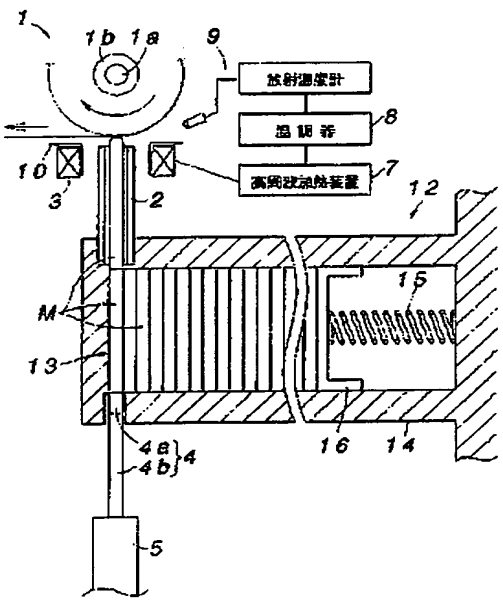
２２　リール

２４ａ、２４ｂ　搬送ローラ

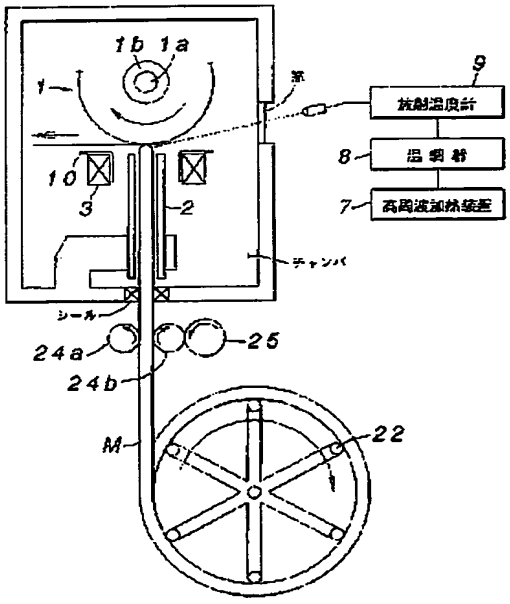
２５　アクチュエータ

＊　Ｍ、Ｍ′　原料金属

【図１】



【図２】



フロントページの続き

(51)Int.Cl.'	識別記号	FI
Ｂ２２Ｄ　11/15	１０４	Ｂ２２Ｄ　11/16　　１０４Ｄ

(56)参考文献　特開　平９－47846（ＪＰ，Ａ）
特開　平９－29399（ＪＰ，Ａ）
特開　平２－224854（ＪＰ，Ａ）
特開　平８－47751（ＪＰ，Ａ）
特開　昭48－4340（ＪＰ，Ａ）

(58)調査した分野(Int.Cl.', ＤＢ名)

B22D 11/06 330
B22D 11/06 360
B22D 11/06 370
B22D 11/00
B22D 11/16
B22D 11/16 104

* NOTICES *

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CLAIMS

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(57) [Claim(s)]
[Claim 1] It is the manufacturing installation of a metal thin line for a periphery to supply the raw material metal fused from the lower part in the copper disk which makes a sharp edge, and form a metal thin line. The tubed guide member which guides this raw material metal from the lower part so that a raw material metal may be exposed near said copper disk, It has a heating means for carrying out melting of said raw material metal near said copper disk, and a means to turn to said copper disk the raw material metal guided to said tubed guide member, and to send it out gradually and continuously. Said copper disk, The manufacturing installation of the metal thin line characterized by insulating electrically a means to send said raw material metal and this out continuously.
[Claim 2] The raw material metal with which the shape of a rod was guided to said raw material metal by nothing and said tubed guide member is turned to said copper disk. Gradually And the supply section of the cylindrical raw material metal with which the means sent out continuously was established directly under said tubed guide member, The head section for pushing up the cylindrical raw material metal guided to said tubed guide member through the supply means which turns said cylindrical raw material metal to said supply section, and carries out sequential supply, and the cylindrical raw material metal supplied to said supply section in order to supply a degree towards said copper disk, Have a means to drive said head section from the lower part, and said head will be lowered if the cylindrical raw material metal currently supplied towards said copper disk becomes that there is nothing in most or all. Next, the manufacturing installation of the metal thin line according to claim 1 which makes it the description as a cylindrical raw material metal is turned to said copper disk through the cylindrical raw material metal supplied to said supply section and it comes to push up gradually.
[Claim 3] The raw material metal with which the line which long ** can roll round was guided to said raw material metal by nothing and said tubed guide member is turned to said copper disk. Gradually And the roller with which the means sent out continuously sends out said raw material metal directly in the lower part of said tubed guide member, the driving means of said roller, and said line -- the manufacturing installation of the metal thin line according to claim 2 characterized by having the reel around which the raw material metal was wound.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacturing installation of a metal thin line.
[0002]
[Description of the Prior Art] From the former, although a metal thin line is formed, the copper disk by which a periphery makes a sharp edge is rotated, a raw material metal is put on a sample holder in the lower part, and there is the so-called molten metal extraction method which it solidifies to heating with a high-frequency-heating coil, and makes a line solidify molten metal continuously by carrying out melting, raising a sample holder after that, and making the above-mentioned copper disk contact.
[0003]
[Problem(s) to be Solved by the Invention] However, in the case of the above-mentioned molten metal extraction method, the amount of a raw material metal was restricted by the magnitude and the configuration of a sample holder, and continuous molding was difficult. Moreover, since raw material metals decreased in number when the sample holder was fixed during formation, the contact condition with a copper disk changed, the wire size of a metal thin line etc. was affected, and there was a problem which says that the quality deteriorates. Here, if a sample holder is moved up in order to secure contact in a copper disk with reduction of for example, a raw material metal, since the physical relationship of this sample holder and a high-frequency-heating coil will change and heating condition will change, temperature management of molten metal becomes difficult, and the quality of a metal thin line deteriorates too. Moreover, when forming a long duration metal thin line continuously, arc discharge arises between a raw material metal and a disk, in order that an overcurrent may flow to heating apparatus and the safety circuit of equipment may work, it becomes impossible to heat, and there is a problem which says that a metal thin line is stabilized and it becomes impossible. The eddy current will arise in a sample and this will be considered for this to discharge, in case a raw material metal and a disk separate momentarily, if it heats with a high frequency coil. Guide a cylindrical raw material metal to the Japanese-Patent-Application-No. No. 219660 [seven to] specification by the same applicant as this application with a tubed guide member from a lower part so that it may expose near the copper disk, and it is made to send out gradually and continuously towards a copper disk, and heating, the equipment which is made to carry out melting, is contacted and forms a metal thin line, and an approach are indicated near the copper disk in the raw material metal. According to this, since the raw material metal of a certain extent can be processed at once and the contact condition of a copper disk and a raw material metal can be maintained in the fixed condition, it becomes possible to form the metal thin line of high quality continuously, but the fault by generating of the above-mentioned arc discharge poses a problem, so that continuation formation is carried out. Moreover, even if it is in the equipment of this specification, that continuation length is restricted to the die length of a cylindrical raw material metal.
[0004] This invention is made in view of the trouble of the conventional technique which was described above, and the main purpose is in offering the manufacturing installation of stability and the metal thin line which can be formed continuously about the metal thin line of high quality.
[0005]
[Means for Solving the Problem] The purpose mentioned above is the manufacturing installation of a metal thin line for a periphery to supply the raw material metal fused from the lower part in the copper disk which makes a sharp edge, and form a metal thin line according to this invention. The tubed guide member which guides this raw material metal from the lower part so that a raw material metal may be exposed near said copper disk, It has a heating means for carrying out melting of said raw material metal near said copper disk, and a means to turn to said copper disk the raw material metal guided to said tubed guide member, and to send it out gradually and continuously. Said copper disk, It is attained by offering the manufacturing installation of the metal thin line characterized by insulating electrically a means to send said raw material metal and this out continuously. The raw material metal with which the shape of a rod was especially guided to said raw material metal by nothing and said tubed guide member is turned to said copper disk. Gradually And the supply section of the cylindrical raw material metal with which the means sent out continuously was established directly under said tubed guide member, The head section for pushing up the cylindrical raw material metal guided to said tubed guide member through the supply means which turns said cylindrical raw material metal to said supply section, and carries out sequential supply, and the cylindrical raw material metal supplied to said supply section in order to supply a degree towards said copper disk, Have a means to drive said head section from the lower part, and said head will be lowered if the cylindrical raw material metal currently supplied towards said copper disk becomes that there is nothing in most or all. Next, [whether a cylindrical raw material metal is turned to said copper disk through the cylindrical raw material metal supplied to said supply section, and it pushes up gradually, and] The raw material metal with which the line which long ** can roll round was guided to said raw material metal by nothing and said tubed guide member is turned to said copper disk. Gradually And the roller with which the means sent out continuously sends out said raw material metal directly in the lower part of said tubed guide member, the driving means of said roller, and said line -- it is good to have the reel around which the raw material metal was wound.
[0006]
[Embodiment of the Invention] Hereafter, the drawing of attachment of the suitable operation gestalt of this invention is explained in detail.
[0007] Drawing 1 is drawing showing the configuration of the manufacturing installation of the metal thin line with which this invention was applied. The tubed guide member 2 which this equipment extends along the direction of a path from the copper disk 1 which rotates centering on the revolving shaft which extends horizontally, and its lower part, and carries out opening near the periphery of the copper disk 1, The high-frequency-heating coil 3 for heating locally the cylindrical raw material metal M of the interior near the opening of this tubed guide member 2, It head section 4a Reaches for pushing up gradually the cylindrical raw

material metal M in the tubed guide member 2 up through cylindrical raw material metal M' supplied to the degree which carries out a postscript, and pushes up, and it consists of rod 4b and pushes up. A member 4, It has the actuator 5 which consists of a stepping motor which drives this push raising member 4. Moreover, the high-frequency-heating equipment 7 which excites this is connected to the high-frequency-heating coil 3. This high-frequency-heating equipment 7 is connected to the radiation thermometer 9 for measuring the temperature of the fused raw material metal M in opening 2a of the tubed guide member 2 by non-contact through a thermoregulator 8. In addition, between the high-frequency-heating coil 3 and the tubed guide member 2 and between the high-frequency-heating coil 3 and the copper disk 1, the heat-resistant electric insulating plate 10 is formed for discharge prevention.

[0008] On the other hand, the supply equipment 12 of the cylindrical raw material metal M is formed in the lower part of the tubed guide member 2. This supply equipment 12 consists of springs 15 which energize the cylindrical raw material metal M received in the case 14 which can supply now the cylindrical raw material metal M one by one from the side of the supply section 13, and this case 14 towards the above-mentioned supply section 13 through a push plate 16 while receiving many cylindrical raw material metals M in a column with the supply section 13 located directly under the tubed guide member 2.

[0009] Here, it pushes up, and it is an electric insulating material, effect of a RF is not received in head section 4a of a member 4, but the tubed guide member 2, and the raw material metal M and the heat-resisting material which does not react are used. It may push up with this head section 4a, and rod 4b may be one or may be another object. Moreover, electric insulating material 1b intervenes also between the copper disk 1 and its revolving-shaft 1a. Furthermore, a push plate 16 and a case 14 are also covered with an insulating material, or it consists of insulating materials. And neither the raw material metal M nor the copper disk 1 is grounded. Therefore, there is no fear of arc discharge occurring among both.

[0010] In addition, the upper limit and the copper disk 1 of the high-frequency-heating coil 3 are good to detach 10mm or more, in order to make it this copper disk 1 not influenced of the heat which is a RF. Moreover, the bore of the tubed guide member 2 is made into less than [phi10mm] so that it may press down the shake of the part which the raw material metal M exposes, and the distance of the upper limit of the tubed guide member 2 and the copper disk 1 is good to be referred to as 5mm or less. Furthermore, the resolution of the actuator 5 (stepping motor) which it pushes up [actuator] and makes rod 4b go up and down has 1/6 or more desirable mm/s. In addition, at least, it pushes up, and it is good [a member] by introducing gas, the copper disk 1, the tubed guide member 2, the high frequency induction heating coil 3, and after making a member 4 into a vacuum (for example, 10-4torr) so that it may receive it in a sealing chamber (not shown) and it may prevent oxidation of a raw material metal and the metal thin line as a product under an anoxia ambient atmosphere to manufacture under an inert gas ambient atmosphere preferably. In case thinning of the raw material metal M fused by manufacturing under an inert gas ambient atmosphere is carried out without holding to a vacuum, it is cooled efficiently.

[0011] Below, the actuation point of this example is explained. First, fixed-speed rotation of the copper disk 1 is carried out with a predetermined rotational speed (for example, 2000rpm). And pushing up the cylindrical raw material metal M gradually (for example, 0.5 mm/sec) through the cylindrical raw material metal M supplied to the supply section 13, and pushing up with a member 4 in order to supply the cylindrical raw material metal guided to the tubed guide member 2 towards the copper disk 1, it has the high-frequency-heating coil 3, and it heats and melting of the point is carried out. Next, the periphery which makes the sharp edge of the copper disk 1 turning around the point of the fused raw material metal M is made to contact, for example, a metal thin line with a diameter of 20 micrometers - about 30 micrometers is formed. It pushes up gradually and the raw material metal M is pushed up with a member 4, and an actuator 5 is controlled so that the contact condition of the periphery of the copper disk 1 and the point of the fused raw material metal M always becomes fixed, as the point of the raw material metal M decreases. Here, if the rate which pushes up the raw material metal M is too early, it will disperse, when the fused metal contacts the copper disk 1, and thinning cannot be carried out. This rate to push up is decided by relation with the rotational speed of the copper disk 1, for example, when the rotational speed of the copper disk 1 is 20 mm/sec extent, it pushes up and 1 or less mm/sec of a rate is desirable.

[0012] Moreover, the temperature of the point of the raw material metal M fused to coincidence is measured with a radiation thermometer 9, and feedback control is carried out so that the point of the raw material metal M may serve as always proper temperature through high-frequency-heating equipment 7 and the high-frequency-heating coil 3 with a thermoregulator 8. Here, as described above, by making the bore of the tubed guide member 2 into less than [phi10mm], the point configuration of the fused raw material metal M is stabilized, a thermometry error becomes small and the stable temperature control of it becomes possible.

[0013] And if the cylindrical raw material metal 1 currently supplied towards the copper disk 1 becomes that there is nothing in most or all, it will push up at high speed (for example, 100 mm/sec), and a member 4 will be lowered. Then, the following cylindrical raw material metal M is supplied to the supply section 13 according to the energization force of a spring 15. This is pushed up from the lower part, and it pushes up gradually again with a member 4. Since these are fused in the upper part as described above, the break of them is lost and they become the same with supplying one long cylindrical raw material metal. Thus, a metal thin line can be continuously formed until the cylindrical raw material metal M is lost in a case 14. Moreover, if the supplement of the cylindrical raw material metal M is enabled in the case 14 on the way, the continuation formation of the metal thin line can be carried out without any restriction.

[0013] Drawing 2 is the same drawing as drawing 1 which shows the configuration of the manufacturing installation of the metal thin line in another operation gestalt to which this invention was applied, gives the same sign to the part which has the same structure as the equipment of drawing 1 , and omits the detailed explanation. With this gestalt, the long line by which raw material metal M' is inscribed in the tubed guide member 2 is wound around nothing and its lower part by the reel 22. moreover, the conveyance rollers 24a and 24b -- having -- a line -- he pinches raw material metal M' directly, and is trying to send out up with an actuator 25 The feed rate is the same as that of the above-mentioned operation gestalt. Moreover, manufacture procedures, such as other equipment configurations and the approach of temperature control, are the same as that of the above-mentioned operation gestalt. in addition, the case where consider as the configuration formed within a sealing chamber as the metal thin line was described above, and the above-mentioned reel 22 is arranged to the exterior -- a line -- it is good to prepare a seal in the path of raw material metal M'.

[0014]

[Effect of the Invention] By the above explanation, according to the manufacturing installation of the metal thin line by this invention, so that clearly A raw material metal is guided with a tubed guide member from a lower part so that it may expose near the copper disk. It is made to send out gradually and continuously towards a copper disk, and a raw material metal is considered as heating and the configuration which is made to carry out melting, is contacted and forms a metal thin line near the copper disk. And a copper disk, By insulating electrically a means to send a raw material metal and this out continuously, the arc discharge between a raw material metal and a disk can be prevented. This becomes possible [forming the metal thin line of high quality continuously] by supplying and supplying a raw material metal continuously, without breaking off, again.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing showing the configuration of the manufacturing installation of the metal thin line with which this invention was applied.
[Drawing 2] The same drawing as drawing 1 which shows the configuration of the manufacturing installation of the metal thin line with which this invention was applied.
[Description of Notations]
1 Copper Disk
1a Revolving shaft
1b Electric insulating material
2 Tubed Guide Member
2a Opening
3 High-frequency-Heating Coil
4 Push Up and it is Member.
4a Head section
4b Push up and it is a rod.
5 Actuator
7 High-frequency-Heating Equipment
8 Thermoregulator
9 Radiation Thermometer
10 Heat-resistant Electric Insulating Plate
12 Supply Equipment
13 Supply Section
14 Case
15 Spring
16 Push Plate
22 Reel
24a, 24b Conveyance roller
25 Actuator
M, M' Raw material metal

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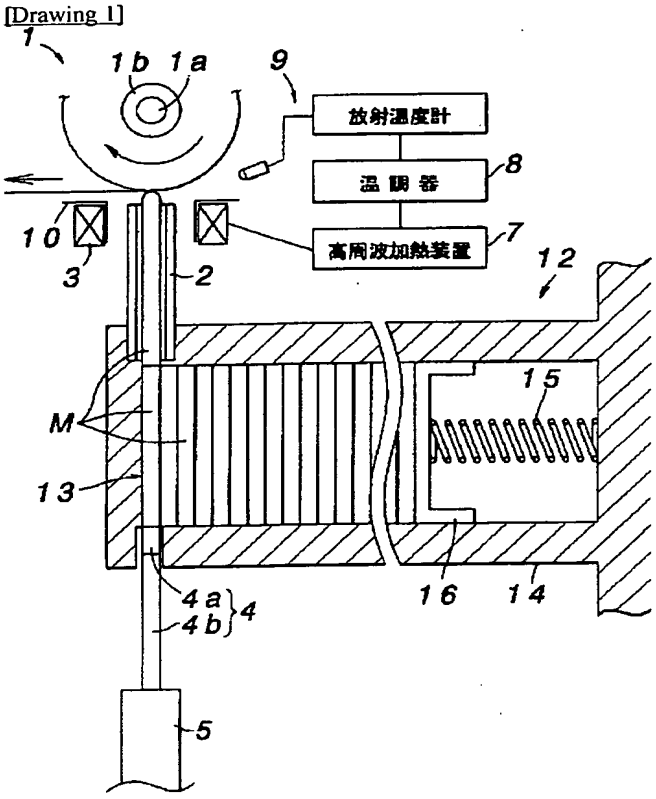
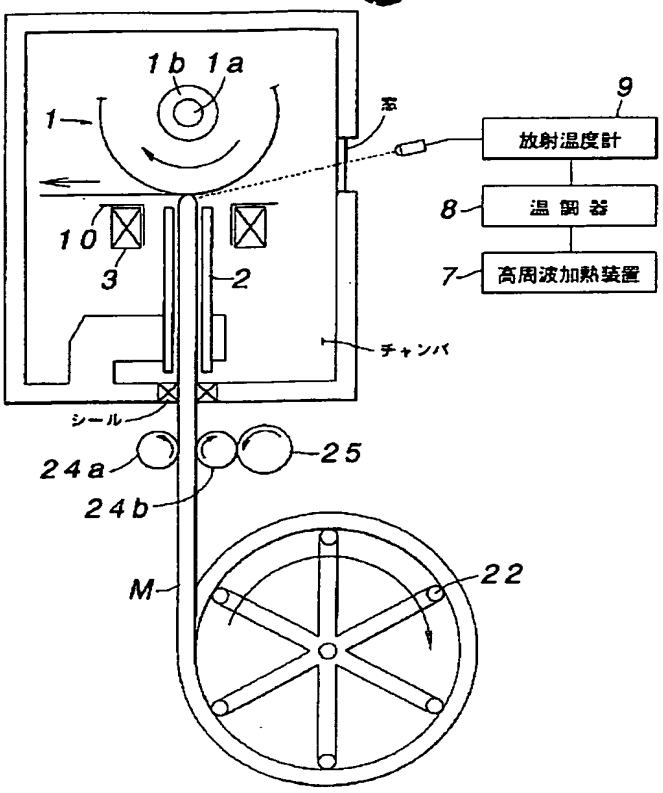
DRAWINGS

[Drawing 1]



[Drawing 2]



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